

illustrations; "A Natural Method of Physical Training," by Edwin Checkley, illustrated from photographs, new edition; "The Law of Psychic Phenomena," a working hypothesis for the study of hypnotism, spiritism, mental therapeutics, &c., by T. J. Hudson.

The Clarendon Press has in active preparation:—"A New English Dictionary," portions of D, edited by Dr. J. A. H. Murray, and of F, edited by H. Bradley; "British Moralists of the Eighteenth Century," edited by L. A. Selby-Bigge, two vols.; "Index Kewensis," compiled at the expense of the late C. R. Darwin, under the direction of Sir Joseph D. Hooker, by B. Daydon Jackson, two vols.; and "An Introduction to the Algebra of Quantics," by E. B. Elliott.

Messrs. G. Bell and Sons have in the press:—"The Mechanism of Men-of-War," by Fleet-Engineer R. C. Oldknow, R.N.; "Torpedoes, Torpedo Boats, and Torpedo Warfare," by Lieut. J. Armstrong, R.N.; "Naval Gunnery," by Capt. H. G. Garbett, R.N.; "Naval Architecture, the Designing and Construction of a Warship," by J. J. Welch; "Logic: a Handbook for the Use of Students," by F. Ryland; "Gas Manufacture," by J. Hornby.

Messrs. James MacLehose and Sons, Glasgow, have in preparation a volume on "Deaf-mutism, including Chapters on the Education of Deaf Mutes," by Dr. J. K. Love and W. H. Addison; a new edition of a "Treatise on Diseases of the Ear," by Dr. Thos. Barr; "An Account of the Institution and Progress of the Faculty of Physicians and Surgeons of Glasgow," by Alexander Duncan.

Messrs. W. Blackwood and Sons' announcements include:—"Introductory Text-Books of Meteorology," by Dr. A. Buchan, new edition, with coloured charts and engravings; Page's "Advanced Text-Book of Geology," new edition, revised and enlarged by Prof. Lapworth; Dr. Mackay's "Elements of Physiography," rewritten and enlarged, "Elementary Algebra," "Mental Arithmetic."

The following additions will be made to Messrs. George Newnes' "Library of Useful Stories":—"The Story of the Earth in Past Ages," by Prof. H. G. Seeley, with original illustrations from the author's collection; and "The Story of the Solar System," by George F. Chambers.

Mr. Edward Arnold will issue:—"The Exploration of the Caucasus," by D. W. Freshfield, in two volumes, illustrated; "Cycling for Health and Pleasure," by L. H. Porter, revised; and "Strength; or, the Development and Use of Muscle," by C. A. Sampson.

Messrs. W. and R. Chambers's list contains:—"Eminent Engineers: "Lives of Watt, Stephenson, Telford, and Brindley"; "Thomas Alva Edison: the Story of his Life and Inventions"; a re-issue of Chambers's Encyclopædia, in ten monthly volumes.

Mr. Fisher Unwin gives notice of:—"The Evergreen: a Northern Seasonal," part ii.; "Electricity for Everybody," illustrated. The Criminology Series.—(2) "Criminal Sociology," by Prof. E. Ferri; (3) "Our Juvenile Offenders," by W. Douglas Morrison.

Messrs. A. D. Innes and Co. will publish:—"A Naturalist in Mid-Africa," by G. F. Scott Elliot, with numerous illustrations.

To Mr. Walter Scott's "Contemporary Science Series" will be added "Evolution in Art, as illustrated by the Life-Histories of Designs," by Prof. A. C. Haddon.

Messrs. W. H. Allen and Co. have in preparation:—"Ferns, British and Foreign," by John Smith, and a new edition of Herschel's "Popular Lectures on Scientific Subjects."

In Messrs. Macmillan and Co.'s announcements we find the following:—"Sir Joseph Banks's Journal," selections edited by Sir Joseph Hooker, K.C.S.I., F.R.S.; "Sketches in Sport and Natural History," by the late Dr. George Kingsley, with memoir by his son Charles Kingsley; "A History of Mankind," by Prof. Friedrich Ratzel, translated from the second German edition by A. J. Butler, with preface by Dr. E. B. Tylor, with thirty coloured plates, maps, and numerous illustrations in the text, in thirty monthly parts, and in three vols.; "Studies in the Art Anatomy of Animals," by Ernest E. Thompson, illustrated; "The Cambridge Natural History," edited by S. F. Harmer and A. E. Shipley, vol. v., Peripatus, by A. Sedgwick, F.R.S., Centipedes, &c., by F. G. Sinclair, Insects, by D. Sharp, F.R.S.; "The Structure and Development of the Mosses and Ferns (Archegoniatae)," by

Dr. Douglas Houghton Campbell; "The Scenery of Switzerland," by Sir John Lubbock; "A Handbook of British Lepidoptera," by Edward Meyrick; "The Structure of Man," by Prof. Wiedersheim, translated by H. M. Bernard, and edited by Prof. G. B. Howes, illustrated; "A Text-book of Comparative Anatomy," by Dr. Arnold Lang, translated into English by Henry M. Bernard and Matilda Bernard, vol. ii.; "Dictionary of Chemical Solubilities," by Dr. Comey; "A System of Medicine," edited by Dr. T. Clifford Allbutt, F.R.S., five vols; "A System of Gynecology," edited by Dr. William Playfair and Dr. T. Clifford Allbutt, F.R.S.; "Elements of Paleontology," by Prof. Karl A. von Zittel, translated and edited by Dr. Charles R. Eastman; "Principles of Mechanics," by the late Prof. H. Hertz, translated by D. E. Jones; "Evolution and Man's Place in Nature," by Rev. Dr. Henry Calderwood, second edition, in great part rewritten; "Miscellaneous Papers," by the late Prof. H. Hertz, translated by D. E. Jones; "Electro-Physiology," by Prof. W. Biedermann, translated by Miss F. A. Wells; "The Scientific Basis of Analytical Chemistry," by Prof. Wilhelm Ostwald, translated by Dr. George MacGowan; "Text-book of Botany," by Prof. Strasburger and others, translated by Dr. H. C. Porter; "The Life of Agassiz," by Jules Marcou, two vols.; "Columbia College, Contributions to Philosophy, Psychology, and Education"; Columbia University Biological Series: "Fishes, Living and Fossil," by Dr. Bashford Dean; Columbia University Press Publications: "Statistics and Sociology," by Prof. Richmond Mayo-Smith; "An Atlas of Fertilization," by Prof. Edmund B. Wilson; "Elements of Geometry," by George C. Edwards; "The Theory of Sociology," by F. H. Giddings; "Alternating Currents," by D. C. Jackson; "A Laboratory Course in Experimental Physics," by W. J. Loudon and J. C. McLennan; "An Exercise Book of Elementary Practical Physics," by R. A. Gregory; "Elementary Text-book of Physical Geography for High Schools," by R. S. Tarr.

GEOLOGY AT THE BRITISH ASSOCIATION.

AFTER the presidential address, which was of great local interest, and listened to with much attention by a large audience, Mr. Harmer read two papers bearing on the Coralline and Red Crag. This veteran geologist, who, with the late Mr. Searles Wood, jun., did so much to unravel the age of the various Tertiary deposits in East Anglia, rendered much service to the Section, not only by the contribution of papers and in the discussions, but by attending the numerous excursions, and placing his knowledge and experience at the service of those less acquainted with Pliocene and Pleistocene rocks.

Taking the 240 more abundant molluscan species found in the Coralline Crag apart from those which are represented by rare or even unique species, he finds that their assemblage points, more distinctly than the mere aggregate of fossils, to the Southern character of the fauna; 57 per cent. being extinct, only one species is not found south of Britain, and not less than 36 per cent. are characteristically Southern. The following summary gives the principal facts on which this conclusion is based.

Summary of the abundant and characteristic Species of Mollusca occurring in the Coralline Crag.

Not known as living (37 per cent.)	...	89
Living in distant seas	...	8
,, ,, the Mediterranean	...	133
,, ,, the West European area	...	9
,, not south of Britain	...	1
Total	...	240

Species of European Mollusca occurring abundantly in the Coralline Crag.

Southern and not British (28 per cent.)	...	42
British (rare) and Southern	...	9
(35 per cent.)	...	51
British (characteristic) and Southern	...	91
,, and not Southern	...	1
Total	...	143
Total number of species	...	436

In his second paper, Mr. Harmer acknowledged that the Eocene shells, and probably some others found in the nodule bed at Waldringfield, were undoubtedly derivative; but he contended that it was possible that others belonged to the period which elapsed between the deposition of the Red Crag at Walton and that at Butley. This conclusion was mainly based on the fact that many of them are found *in situ* in the Belgian Crags of this age.

Mr. Burrows followed with a paper on the distribution of Foraminifera in the Crags. In the Upper Crag, or Newer Pliocene, there are 29 species of common North Atlantic Foraminifera; in the Red Crag 20 species; and in the St. Erth beds 163, of which 66 occur also in the Coralline Crag. Some of the Coralline Crag Foraminifera appear to have been derived from older deposits. Notes were given on the age of the different portions of the Coralline Crag now or formerly exposed at several important localities.

Next came two papers on Southwold; the first by Mr. H. B. Woodward, on a section recently exposed by denudation at the North Cliff, and a second on recent coast erosion there, by Mr. Spiller. The Norwich Crag is succeeded by chalky boulder clay, and that by a fresh-water loam, peaty earth, and a recent beach deposit, in which a human skeleton was found this year. Mr. Spiller's paper gave an account of the erosion of the North Cliff during a storm in May last, and by measurements taken since, and comparison with a map previously made by Mr. Whitaker, he concluded that different points on the coast had been eroded at the following rate:—

		Loss in 6 years	Feet.
Easton Bavents	...	...	20
Easton High Cliff	...	13 "	22
Covehithe Cliff	...	6 "	84

In two short papers which followed, the Rev. E. Hill attributed the formation of some boulder clays to rapid deposit by the agency of water under the influence of floating ice and ice-rafts, a conclusion strongly controverted by several advocates of the land-ice theory who were present. A third paper, by the same author, described traces of an ancient watercourse seven miles long in Suffolk.

A paper, by Messrs. Reid and Ridley, described their recent researches by boring, and an examination of the deposits above the water-level, at Hoxne. The following is the section disclosed, revealing the apparent existence of a temperate flora between the morainic deposits and the Arctic plant bed. A grant was made by the Association to enable Mr. Reid to continue this work, with a view of determining the relation of the Paleolithic remains to the Glacial epoch.

	Feet.
Gravelly surface soil	about 2
Brick-earth; towards the base <i>Valvata piscinalis</i> , cyprids, bones of ox, horse, elephant (?), and Paleolithic implements	about 12
Sandy gravel, sometimes carbonaceous, with flint flakes	about 1
Peaty clay, with leaves of Arctic plants (?)	about 4
Lignite, with wood of yew, oak (?), white birch, and seeds of cornel, &c.	about 1
Green calcareous clay, with fish, <i>Valvata piscinalis</i> , <i>Bythinia tentaculata</i> , cyprids, <i>Ranunculus repens</i> , <i>Carex</i>	about 4
Boulder clay.	

The day's work was closed by a paper from the President, on some Suffolk wells, six of which penetrate some distance into the chalk.

Tuesday was devoted almost exclusively to papers on glacial subjects, opening with an interesting communication by Prof. Sollas on artificial glaciers, or "poissiers," made of pitch. This paper was illustrated by pitch models split longitudinally, lantern photographs, and models in Canada balsam, images of which could be thrown on the screen. The main point to which attention was directed was the power of the viscous substance to carry grains of rice, sand, or pigment uphill when confronted by a barrier, or when driven into a narrow gorge. The conclusion drawn was that ice and pitch conformed to the laws of fluid motion, and this was further illustrated by the flow of water over a raised model of Ireland, when the currents conformed to the directions of former ice movement. The pitch sometimes travelled over heaps of loose material without disturbing them.

Mr. Clement Reid followed with some illustrations of the glacial sections at Cromer, showing the great chalk boulders, the contortion of the chalk, and the contortion, crushing, brecciation, and shearing of the boulder clay at that locality. Prof. W. B. Scott gave an illustrated description of the "Bad Lands," and showed that this area was in Tertiary times the site of a succession of great lakes whose history extended from the beginning of the Eocene period up to Pleistocene times. Evidence of change in climate is given by the gradual disappearance of palms, and the diminution in numbers and variety of the reptiles. A paper by Mr. R. B. White described various deposits in Colombia (New Granada) to which he attributed a glacial origin; he recognises moraines, erratic blocks, breccias and conglomerates, in places mostly made up of volcanic materials, but elsewhere made of the debris of sedimentary rocks. The paper concluded with some novel speculations as to the cause of the Ice Age.

Mr. B. Thompson described a number of pre-glacial valleys Northamptonshire, belonging to the following chief types. New valleys without drift and having old filled-up valleys near at hand; (2) valleys with rock on one side and drift on the other; (3) streams re-excavating old, drift-filled, valleys; (4) re-excavated valleys with the drift only left in the form of river-gravel derived from it. In his account of some Snowdonian tarns, Mr. W. W. Watts concluded that one of the shallow lakes in Cwm Glas was in a very shallow rock-basin, and the other dammed by scree and stream-detritus. Glaslyn and Llyn Llydaw, though finding exit over moraine, had rock-barriers at depths of from thirty to fifty feet below the lake surface, so that they are either confined in true rock-basins, or else are very much shallower than is generally supposed.

The Committee for exploring the supposed glacial shell-bed at Clava, hoped to bring important results out within the year, and that engaged in exploring the Calf Hole cave also hoped to finish its lists of fossils in the same period. In reporting on the high-level flint drift near Ightham, Mr. Harrison described excavations made into a gravel 658 feet above the sea on the face of the chalk escarpment; worked flints, chiefly scrapers and flakes, were found in great quantity. In the discussion Sir John Evans expressed scepticism as to the human origin of the supposed worked flints.

The Committee on Coast Erosion published a final report which contains an abstract of previous reports, and a considerable amount of new information from Kent, Suffolk, Sussex, Hampshire, Norfolk, Yorkshire, the Northern counties, Lancashire, and North Wales. The Committee concludes that the work of devastation is much aided by the abstraction of shingle and sand, and also by the erection of unsatisfactory sea-walls and groynes. They further recommend that the subject should become the work of a departmental Committee of the House of Commons. The twenty-first and final report of another long-standing Committee gives a useful summary of principles guiding underground water supply, and then resigns its task to the local scientific societies, which are urged to communicate all information received to the Geological Survey Office at Jermyn-street, where careful records are now kept. Such a course naturally will give increased value to the information daily supplied to inquirers from that office. In the last paper Mr. Holmes gave further information on an ancient silted-up stream course which flowed between the high ground of Warley, Billericay, and Maldon on the one hand, and that of Laindon, Rayleigh, and Althorne on the other, into the Blackwater. The deposits of this river were covered by the highest (oldest) gravel terrace of the Thames system. A paper by Messrs. Lomas and Kendall dealt with the striae produced by modern glaciers.

The first paper on Saturday was that of Prof. Marsh on some European Dinosaurs. He exhibited a diagram placing American and European forms side by side, and showing that the European types filled up gaps in the American series. In many of his restorations he differed decidedly from those which have been previously published, some of which he characterised as being like nothing "in heaven above, or in the earth beneath, or in the waters under the earth." The Connecticut Triassic footprints he attributed to Dinosaurs and not birds. The Committee appointed to endeavour to recover the missing portions of the Cetiosaurus skeleton in the Oxford Museum had been unable to carry out their work within the year, but they had now determined on their course of action, and obtained the requisite permission, so that they hoped to complete the work before the Liverpool meeting. Mr. Montagu Browne communicated a description of a section

on the new Manchester, Sheffield, and Lincolnshire Railway, exposing Rhætic rocks in Nottinghamshire, and gave a list of fossils derived from these beds.

The first part of Monday's sitting was devoted to papers by authors from France and Belgium. M. G. F. Dollfus considered that in Upper Tertiary times there were two great seas in Western Europe; one was to the east, not very far from Eastern England, in Miocene times, and extended over the Netherlands and North Germany; the other, or old Atlantic, was to the west of England, and extended in gulfs into France and Portugal, probably communicating with the Mediterranean Sea along the Guadalquivir Valley. In Pliocene times the seas occupied similar positions, but the land was rather higher, and a gulf on the Atlantic side appears to have reached Cornwall. The English Channel was closed, and the Eastern Sea appears to have been open only towards the north. M. Van den Broeck's paper described the present state of knowledge of the Upper Tertiary strata of Belgium. He had determined that the Upper Oligocene strata did not exist in Belgium, but that the Upper Pliocene was probably present there. He concluded that the line of march of the Miocene fauna was from east to west, for Miocene forms present in Belgium were absent from England. That the Miocene formation had been once present in England he inferred from the fact that half the Belgian Miocene fauna was to be found in the Coralline Crag. A communication from M. M. Boule described the finding of remains of *Elephas meridionalis* and *E. antiquus* in association with worked flints, some of them of elaborate workmanship, but others of St. Acheul type, and mammoth tusks, one of which was 2·85 metres in length; one flint was found under a tusk of *E. meridionalis*.

Prof. John Milne's report on Japanese earthquakes was given in full to Section A, but a short account of his work was communicated to Section C. The author has prepared a catalogue of 8331 shocks recorded in Japan between 1885 and 1892. The instruments used have recorded earthquakes which must have travelled right through the earth with a velocity greater than if its interior were composed of glass or steel. They also indicate movements corresponding with variations in barometric pressure and strong winds, and even a diurnal variation possibly due to the evaporation of moisture and the condensation of dew.

Dr. H. J. Johnston-Lavis reported on the activity of Vesuvius during 1895. (The substance of his report has already appeared in NATURE for August 8). The Committee on coral reef exploration presented an interim report on the negotiations between the Royal Society and the Admiralty as to beginning the work of sounding and boring. Mr. Osmund Jeffs reported that a number of the geological photographs collected by his Committee had found a home at the Museum of Practical Geology in Jermyn-street, and that the rest would shortly be deposited there. Prints to the number of 1200 had been received and catalogued, but numerous localities, and particularly the Eastern Counties, were as yet poorly represented. The report contained some valuable recommendations for the apparatus suitable for continuing the work, and the Committee proposed to carry on its collection, and to make special efforts to induce local societies and individuals to fill up the blanks in the collection, and to make it a thorough photographic survey of geological phenomena throughout the United Kingdom. A valuable appendix to the report contained a list of such of the photographs as had been employed in illustrating geological works. Dr. Hatch's paper on the auriferous conglomerates of the Witwatersrand showed that gold occurred only in the matrix of these rocks, and not in the pebbles; it had probably been introduced by subsequent infiltration. Mr. E. A. Walford, in a report and paper, described the succession of limestones, clays, and sandstones which have been revealed by sinking between the Stonesfield slate and the Inferior Oolite in Oxfordshire, and traced these divisions north-west and south-east, correlating the upper calcareous division with the Fullonian, and the middle sandy division with the Northamptonshire Estuarine series.

The early part of Tuesday was devoted to papers on deep borings, and the later part to work chiefly on invertebrate palæontology. The President described the succession of rocks revealed by the experimental boring at Stutton. The section which heads the top of the next column gives that succession. The lowest rocks are likely to be of Carboniferous or Silurian age, but the absence of fossils renders it impossible to be sure which of these divisions they really belong to. The boring has now been carried down to a depth of 1356 feet, mostly in highly inclined and even vertical strata of the same doubtful character.

	Feet.
Drift (river gravel)	16
London clay and Reading beds	54
Upper and middle chalk	720
Lower chalk, with very glauconitic marl at the base (almost a green sandstone)	154½
Gault	49½
Palæozoic rock, with a high dip.	

Mr. J. Francis gave the methods and results, hitherto unpublished or incorrectly stated, of the attempt to determine the dip of strata met with in deep wells at Ware and Turnford. After rejecting various magnetic and mechanical appliances, the following device was hit upon. The boring tools were lowered with extreme precautions to prevent any torsion during the lowering, and by means of steel points connected with them the direction of a known diameter was marked by vertical chases on the circumference of the core while still *in situ*; during the raising of the tool no twisting occurred; a wax mould of the top of the core *in situ* was then taken, and again the lowering and raising were done without twisting. The core was then broken and lifted, and by means of the diameter marked on it *in situ*, confirmed by a known line on the wax mould, the direction and amount of dip was ascertained. To test the method the boring was continued, and after the top of the core had been ground to a flat surface, steel-punch marks along a known diameter, maintained by careful lowering and raising with the same precautions, were impressed on the surface, and again the core was broken and lifted. This observation was within a degree of the previous one; so that there is probably only a negligible error, or none, in the observations. The dip of the Silurian rock at Ware at 828 feet below the surface was 1° west of south, at an angle of 41°. Similar experiments at Turnford, carried out with rather less success, gave the dip of the Devonian rocks at 994 feet as 17° west of south at 25° from the horizon. These dips correspond with those of the Secondary rocks off the Wealden axis. The south-easterly dip which has been published for one of these instances is incorrect. Mr. Harmer, in a paper which followed, advocated that the survey of deep-seated rocks by borings should be systematically carried out by the Geological Survey, the expense being provided for indirectly by the appreciation of real property, and directly by royalty, wherever success attended the operations.

Prof. Claypole described some whole specimens of Cladodonts from the Devonian rocks of Ohio, which showed that many species hitherto defined from single and isolated teeth can no longer be maintained. The Upper Devonian shales of the same region have yielded many genera of large Placoderms; the head of *Dinichthys* measured from 2 to 3 feet in length; *Titanichthys* was still longer; and the jaws of *Gorgonichthys* alone measured 24 inches in length, ending in teeth or points from 6 to 9 inches in length. All these genera are closely allied to *Coccosteus*.

One of the most important papers of the meeting was that by Prof. Nicholson and Mr. Marr on the Phylogeny of the Graptolites. They are led to believe that a character of essential importance in dealing with the classification of the Graptolites, and one which, in all probability, indicates the true line of descent, is found in the shape and structure of the hydrothecæ, the point of next importance as indicating genetic relationship being the "angle of divergence"! These views are illustrated by reference to forms belonging to the "genera" *Bryograptus*, *Diplograptus*, *Tetragraptus*, and *Didymograptus*, which appear in turn in this sequence. Out of nine *Tetragrapti* (and the authors know of no other forms referred to this genus which are represented by well-preserved examples), eight are closely represented by forms of *Didymograptus*, which are closely comparable with them as regards characters of hydrothecæ and amount of "angle of divergence," whilst the ninth is comparable with a *Didymograptus* as regards "angle of divergence" only. Moreover, four of the *Tetragrapti* are comparable as regards the two above-named important characters with forms of *Dichograptus* and *Bryograptus* with eight or more branches, and the authors confidently predict the discovery of forms belonging to these or closely allied many-branched "genera," agreeing with the remaining *Tetragrapti* in what they regard as essential characters. They give details showing points of agreement of each group of the various series, including a two-branched, a four-branched, and a many-branched form, and point out how difficult it is to understand how the extraordinary resemblances between the various species of *Tetragraptus* and *Didymograptus* (to take one example) have

arisen, if, as usually supposed, all the species of a "genus" have descended from a common ancestral for each genus, in the one case four-branched, and in the other case two-branched. On the other hand, it is comparatively easy to explain the more or less simultaneous existence of forms possessing the same number of stipes, but otherwise only distantly related, if they are different ancestral types. Phenomena somewhat analogous have been detected amongst the species of Ammonites and Brachiopods. Following these inferences to their legitimate conclusion, the authors point out how "genera," like *Diplograptus* and *Monograptus*, may contain representatives of more than one "family" of graptolites according to the classification now in vogue, which would account for the great diversity in the characters in the monograptid hydrothece.

Messrs. Garwood and Muir followed with a paper on the zonal divisions of the Carboniferous system. The following zones are recognised by them :—

- Zone of *Productus* c.f. *edelburgensis*.
- " " *latissimus*.
- " " *giganteus*.
- " *Chonetes papilionacea*.
- " *Spirifera octoplicata*.

Mr. Garwood has traced the zone of *P. latissimus* occupying the same position relative to that of *P. giganteus* from Settle, in Yorkshire, to the Northumbrian coast, near Howick Burn. In conclusion, the authors hope that their work may be continued by a Committee, and one was appointed by the Section and confirmed by the General Committee of the Association.

Prof. T. Rupert Jones, in the twelfth report on Palæozoic Phyllopora, gave a *résumé* of these organisms referred to in previous reports, and appended some valuable notes and two tables by Prof. Lapworth, of which the first gives a general correlation table of the Lower Palæozoic rocks; the second, the horizons of the chief species of Phyllopora. A third table gives a list of the geological order of species. After hearing interim reports from the Committees on Eurypterids, and on type specimens, the Section listened to a paper by Dr. Woodward on Decapod Crustaceans from the Cretaceous rocks of Vancouver, in which the following new species were described. *Callianassa Whiteavesii*, *Paleocorystes Harveyi*, *Plagiophthalmus (?) vancouverensis*, and *Homolopsis Richardsoni*. Many of these forms approach contemporaneous European types. The closing report was that on erratic blocks. The Yorkshire Boulder Committee and that of the Hull Geological Society are promoting a systematic survey of the ground. New work has also been done in Lincolnshire, Shropshire, Cheshire, South Wales, and Ireland.

A very pleasant feature of this year's meeting has been a series of afternoon walks or drives, carefully planned by the Local Secretary, Mr. Ridley; in many of these the President took the leadership, and several members of the Section attended. The list of these included Bramford, Sproughton, Orford, Sudbourne, Butley and Chillesford, Woodbridge and Sutton, Tattingstone, Bawdsey, Foxhall, and Cromer. At several of these localities the sections had been freshly scarped or reopened by the Local Committee and by the landowners. It is much to be hoped that in future similar opportunities may be afforded of acquiring as full a knowledge of the geology of the neighbourhood in which the meeting is held.

ZOOLOGY AT THE BRITISH ASSOCIATION.

AS this Section was occupied with dredging excursions on the Saturday and Wednesday, only four days were available for sectional meetings, and as the number of papers and reports to be discussed was large (nearly fifty), the sittings were continued late into the afternoon. The majority of the papers dealt with marine zoological subjects, and fishery questions received special attention.

After the President's address on Thursday, the following reports of Committees were taken :—

On the marine zoology, botany, and geology of the Irish Sea. The report deals with nine dredging expeditions held during the past year, and discusses the additions made to the known fauna. Statistics of the dredging results are given to show (1) the relative richness, per haul, of the shallower over the deeper waters, and (2) the relatively large number of genera represented by the species in one haul; pointing to the conclusion that, as a rule, allied species are not found together. The submarine deposits round the Isle of Man, and the currents of the Irish Sea are also discussed.

On the migration of birds. The nine years' observations are now being tabulated for presentation at next meeting.

Investigation of the zoology of the Sandwich Islands. Valuable collections are being made and brought home, and unless these are made now they can never be done, as the extinction of much of the present fauna is not only inevitable, but will be immediate.

Research at the Zoological Station at Naples. The British Association table has been occupied by Mr. M. D. Hill, who has been investigating the maturation and fecundation of the ova of Echinodermata and Tunicata.

Research at the Marine Biological Laboratory at Plymouth. This Committee have enabled Miss Florence Buchanan to work out the blood-forming organ in the larva of Magelona; Mr. E. J. Allen to work on the nervous system of the embryonic lobster; and Mr. Sumner to work at the Echinoderm fauna of Plymouth.

Investigation of the fauna and flora of the West Indian Islands. The Committee reported upon the progress made in working up the collections.

On an Index Generum et Specierum Animalium. In Mr. Sherborn's hands the Index is making satisfactory progress.

On the physiological applications of the phonograph. The Committee are studying the marks on the cylinder of the phonograph by microphotographs and by recording curves, and they propose to make these available for philological purposes in the study of dialects.

The following papers were then taken :—

On the Stereornithes, by C. W. Andrews. They are a heterogeneous group of extinct birds, found in Patagonia, whose chief points of resemblance lie in their large size and reduced power of flight. Some of them, at least, have no special affinities with the living Ratitæ. They are not represented in European museums.

Facts and reflections on budding in compound Ascidiæ, by Prof. W. E. Ritter (California). The author argues for the polyphyletic origin of the compound Ascidiæ; he considers that there is no homologue of the "epicardium" of *Clavelina* in either *Goodstiria* or *Botryllus*; he suggests that budding has arisen in small Ascidiæ as a compensation for diminished power of sexual reproduction; he believes that physiological necessities have modified the course of development by budding, so that the endoderm now produces some organs originally formed from ectoderm.

A new classification of the Tunicata, by W. Garstang. The author gave his reasons for proposing to modify the classifications given by Herdman and by Lahille, by adopting some of the features of each scheme. In the main he proposes to follow Herdman in the primary divisions, and Lahille in the subdivisions. He considers *Pyrosoma* to be related to the pelagic forms, such as *Salpa*, and not to the fixed Ascidiæ. He makes use of the branchial sac largely in classification. This paper gave rise to an interesting discussion.

On the presence of skeletal elements between the mandibular and hyoid arches of *Hexanchus* and *Lamargus*; and on the presence of a sternum in *Hexanchus griseus*, by Dr. P. White.

On the Creodonts, by Prof. W. B. Scott. This and some of the other papers gave rise to considerable discussion, and the Section did not adjourn till about five o'clock.

In the course of the day's proceedings it was moved by Prof. W. A. Herdman (President of the Section), seconded by Dr. P. L. Sclater (past-President), and carried unanimously, that the zoologists of this Section desire to present to Dr. John Murray their congratulations on the completion of the *Challenger* publications, and their best thanks for his splendid services to science. This resolution was duly conveyed to Dr. Murray, and a letter of thanks from him was received by the Section later in the meeting.

Friday was devoted to papers and discussions on the marine fisheries. Prof. McIntosh led off with a paper on some of the results of scientific investigations as applied to the fisheries. He gave a useful summary of what had been effected by the Scottish Fishery Board; he showed that the three-mile limit was insufficient to protect the spawning fishes, and in conclusion urged that scientific investigations on the fisheries should be carried out by Government and not be left to Universities.

Prof. Haddon followed with a report on the Royal Dublin Society's Fishery Survey, and also gave an account of the Fishery School at Ringsend, near Dublin. He pointed out the special conditions of the Irish fishery grounds, the lack of access to markets and of fish-curing stations on the west.

Dr. Bashford Dean (U.S. Fish Commission) gave an account